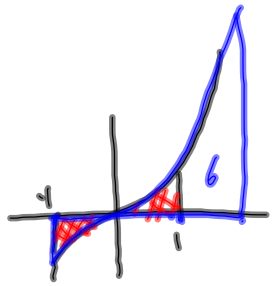
30.

$$\int_1^4 -x^{-2}\,dx$$

6. $\int_{-1}^{1} h(r)\,dr = 0$ $\int_{1}^{3} h(r)\,dr = 6$



a) $\int_1^3 h(r)\,dr = \int_{-1}^{3} h(r)\,dr - \int_{-1}^{1} h(r)\,dr = 6 - 0 = 6$

b) $-\int_3^1 h(w)\,dw$

$= \int_1^3 h(w)\,dw = 6$

$\int_{-1}^{1} + \int_1^3 = \int_{-1}^{3}$

$\int_a^b + \int_b^c = \int_a^c$

$\int_b^c = \int_a^c - \int_a^b$

Nov 13-11:27 AM

5.3b Definite Integrals and Antiderivatives

Rules for Definite Integrals

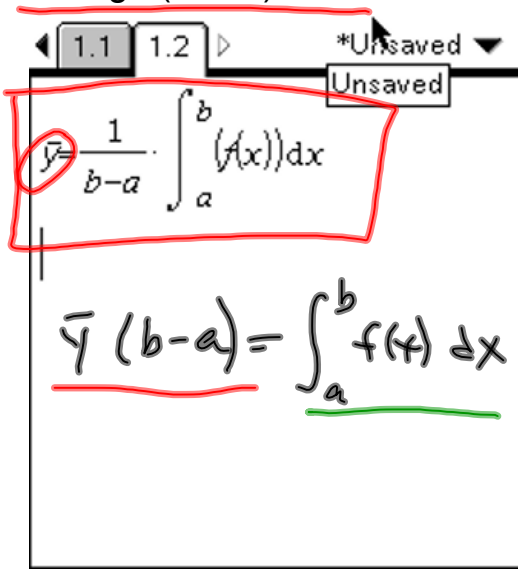
$$\int_a^b f(x)\,dx = -\int_b^a f(x)\,dx$$

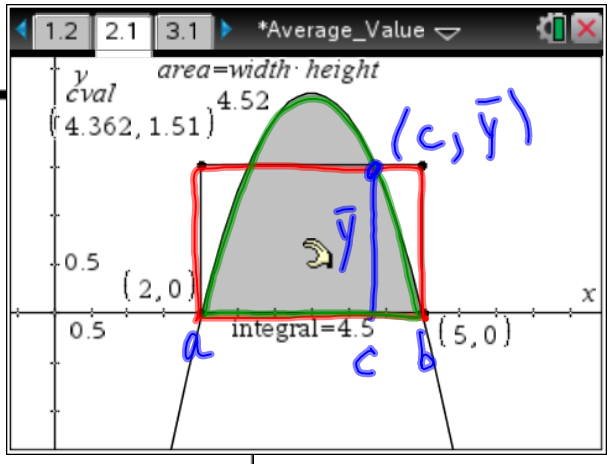
$$\int_a^b f(x)\,dx + \int_b^c f(x)\,dx = \int_a^c f(x)\,dx$$

$a < b < c$

Nov 13-4:58 PM

Average (Mean) Value





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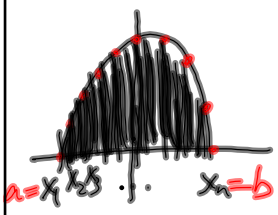


$\lim_{n\to\infty} \frac{f(x_1)+f(x_2)\cdots+f(x_n)}{n}$

$\Delta x=\frac{b-a}{n}$

$n=\frac{b-a}{\Delta x}$

$\lim_{n\to\infty} \frac{\sum_{i=1}^{n} f(x_i)}{n\,\frac{(b-a)}{\Delta x}}$

$\frac{\lim_{n\to\infty} \sum_{i=1}^{n} f(x_i)\,\Delta x}{b-a}$

$\bar{y}=\frac{\int_a^b f(x)\,dx}{b-a}$

$\bar{y}=\frac{1}{b-a}\int_a^b f(x)\,dx$

Nov 13-11:57 AM

Find the average value of f(x) = 4-x^2 on [0,3]. Does *f* actually take on this value at some point on the given interval? If yes, where?

$$\bar{y} = \frac{1}{3-0}\int_0^3 4-x^2\,dx \qquad f = 4-x^2$$

$$\bar{y} = \frac{1}{3}\left(4x - \frac{x^3}{3}\right|_0^3 \qquad x = \pm\sqrt{3}$$

$$\bar{y} = \frac{1}{3}\left((4\cdot 3 - \frac{3^3}{3}) - (0-0)\right) \qquad \bar{y} = f(c)$$

$$\bar{y} = \frac{1}{3}(12-9) = 1$$

Nov 13-5:12 PM

Mean Value Theorem for Definite Integrals

p 288

MVT: If f is continuous then there is a "c" between a & b so that

$$\bar{y} = f(c) = \frac{1}{b-a}\int_a^b f(x)\,dx$$

Nov 13-5:29 PM

How long is the average vertical chord of a circle of radius 4? Find the value that satisfies the Mean Value Theorem for Definite Integrals.

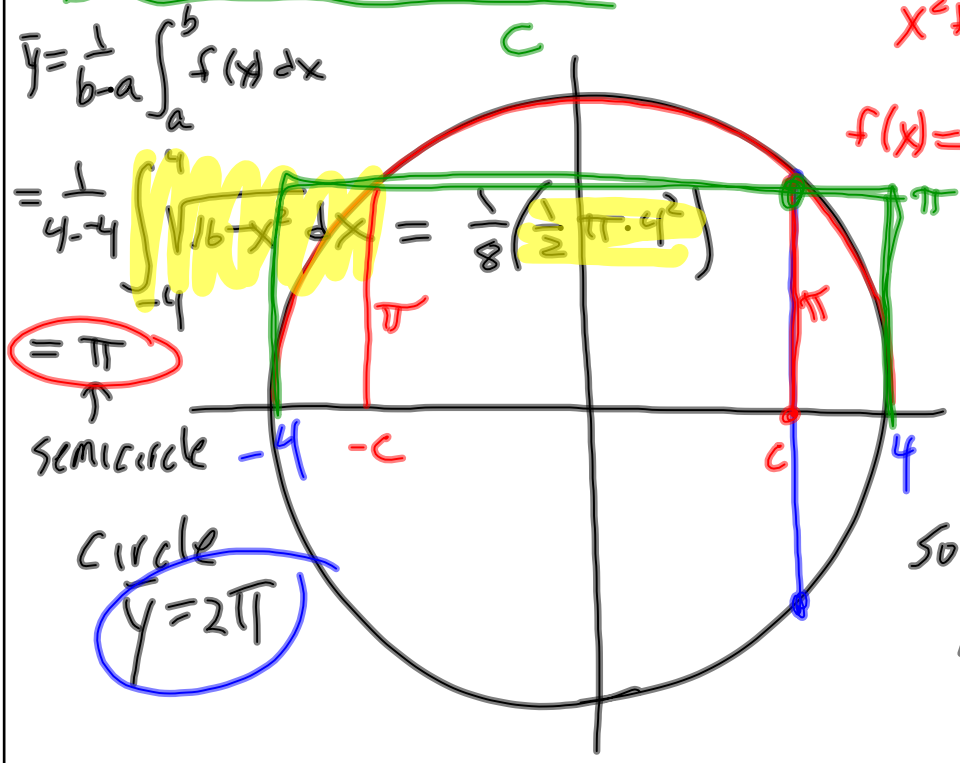
$\bar{y} = \frac{1}{b-a}\int_a^b f(x)\,dx$

$= \frac{1}{4-4}\int_{-4}^{4} \sqrt{16-x^2}\,dx = \frac{1}{8}\left(\frac{1}{2}\pi \cdot 4^2\right)$

$= \pi$

semicircle

Circle $y = 2\pi$



$x^2 + y^2 = 16$

$f(x) = \sqrt{16-x^2}$

$\pi = \sqrt{16-x^2}$

solve for x

$x = \pm 2.476$

Nov 13-5:31 PM